

PRELIMINARY DATA SUMMARY

October 1987

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Field Research Facility Measurement and Analysis Work Unit at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility in Duck, North Carolina. The data were collected and the analyses performed by the FRF staff. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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I. INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Fig.1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The FRF consists of a 561-m (1,840 ft) long concrete research pier supported on 0.91 m (3 ft) diameter steel piles. The pier deck is 6.1 m (20 ft) wide, 7.74 m (25.4 ft) above mean sea level (MSL), and extends from behind the dunes to approximately the 7.6 m (25 ft) depth contour. In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Most of the data are daily observations or the results of preliminary data analysis. In many instances, continuous analog records and more extensive analyses will be made available later by the CERC Coastal Engineering Information and Analysis Center (CEIAC).

Table 1 is a list of instruments used, their status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depth at the wave gages and current meters vary and may best be determined from the information contained in Figure 8. Other installation information is contained in Table 1. All times unless otherwise specified are referenced to Eastern Standard Time (EST).

Section II presents the meteorological data; Sections III through VI, oceanographic data; Section VII, nearshore profiles and bathymetry; and Section VIII, if included, documents special events that occurred at the FRF during the month.

Questions and/or comments concerning the data may be directed to Mr. Herman C. Miller at (919) 261-3511.

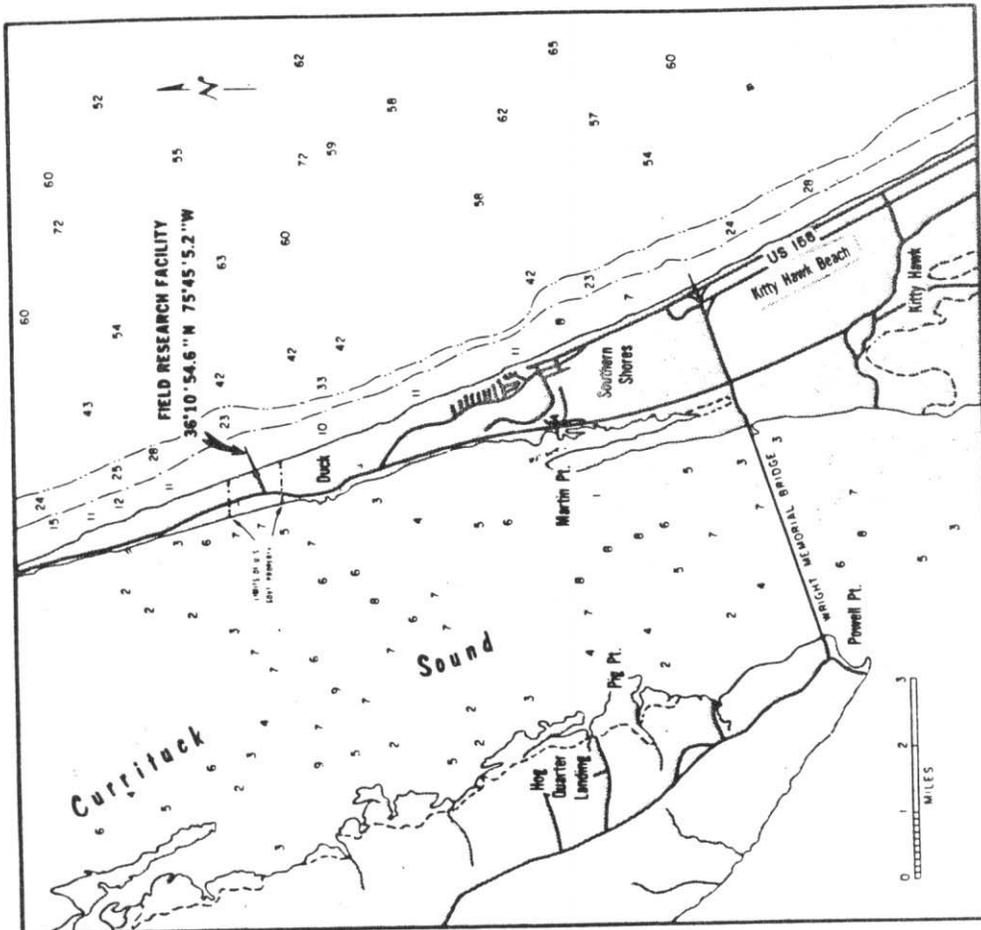
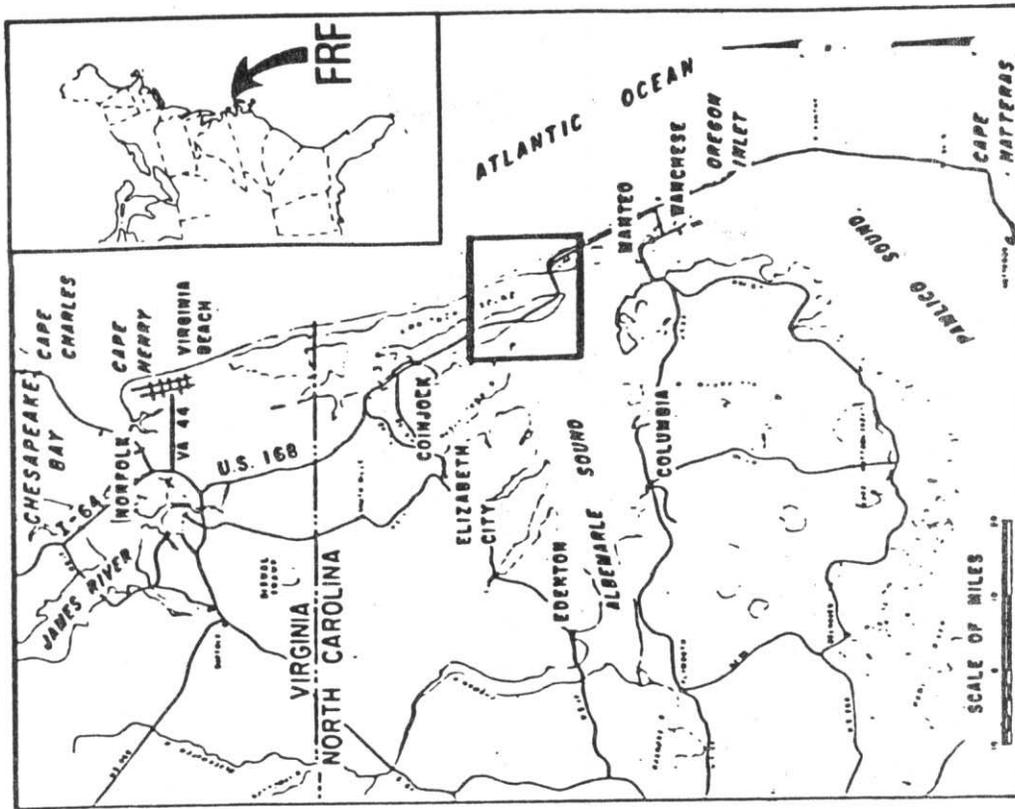


Figure 1. FRF location map.

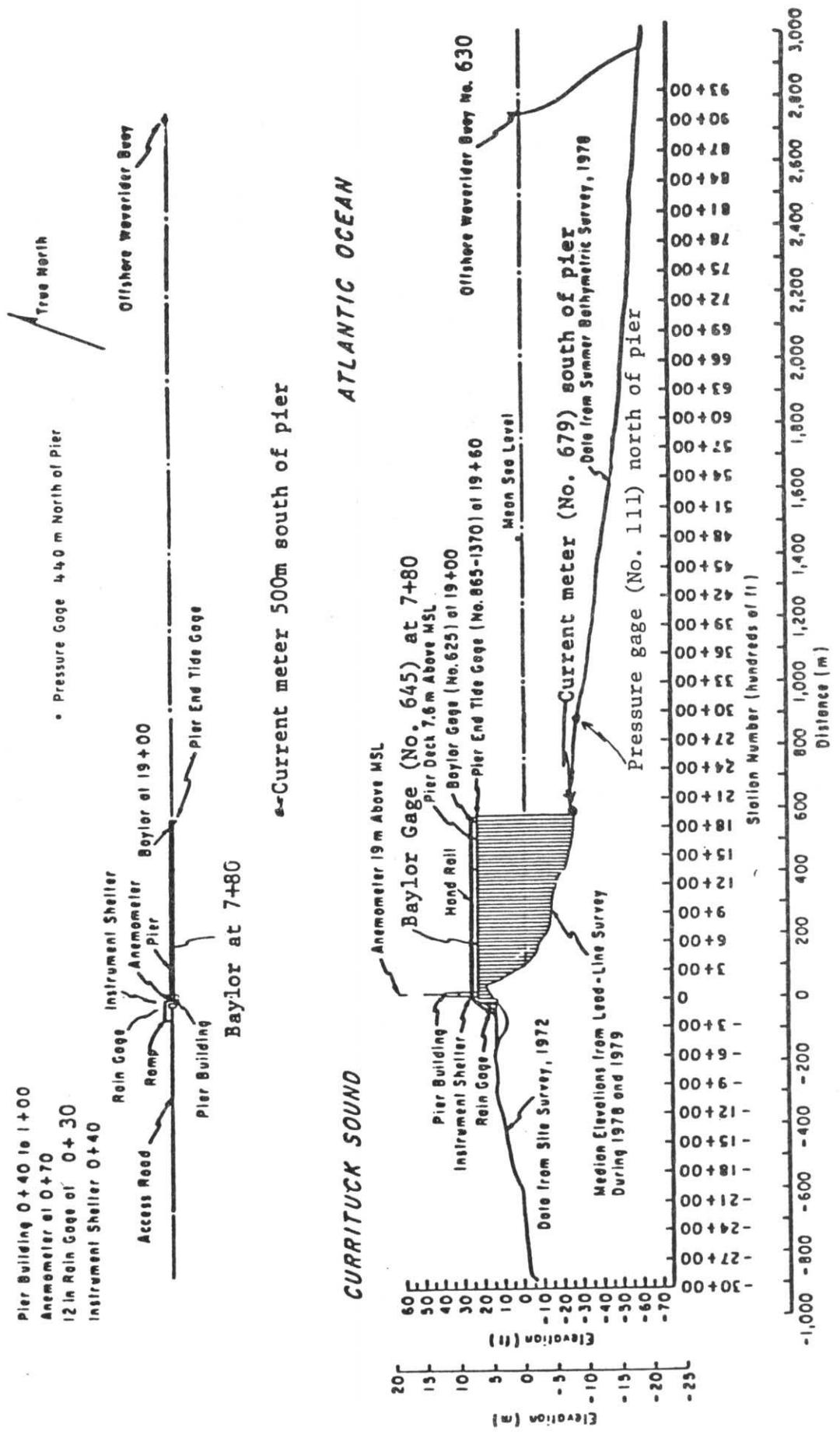


Figure 2. Instrument locations at FRF.

II. METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Fig. 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

The wind measurements are obtained from a Weather Measure Skyvane located on the FRF laboratory building (Fig. 2), 19.1 m above mean sea level (MSL).

The high and low temperatures are obtained from daily readings of NWS maximum and minimum thermometers and represent the extreme temperature values since the last reading.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in) -
 $\text{mm} \times .03937 = \text{in}$
2. Millibars (mb) to inches of mercury (in Hg) -
 $\text{mb} \times 0.02953 = \text{in Hg}$
3. Degrees Celcius (C) to degrees Fahrenheit (F) -
 $(\text{C} \times 9/5) + 32 = \text{F}$
4. Meters per second (m/s) to knots (kn) -
 $\text{m/s} \times 1.943 = \text{kn}$

TABLE 2: Meteorological Data

OCT 1987

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation
		Speed	Direction	deg TN	deg C	Pressure
		m/s			mb	
1	100	6	299	18.0	1004.0	0
	700	10	328	15.8	1006.7	0
	1300	8	316	18.6	1008.7	0
	1900	4	290	16.7	1014.5	0
2	100	3	172	14.8	1016.5	0
	700	3	175	17.9	1018.9	0
	1300	6	180	23.4	1017.2	0
	1900	4	164	20.1	1015.5	0
3	100	3	214	18.8	1014.5	0
	700	4	225	20.2	1013.1	0
	1300	5	197	25.2	1009.1	0
	1900	10	291	10.6	1014.2	5
4	100	11	293	9.4	1017.5	0
	700	9	318	9.6	1019.2	0
	1300	7	300	14.0	1018.2	0
	1900	3	298	12.0	1018.2	0
5	100	4	277	11.8	1018.6	0
	700	4	293	12.4	1019.2	0
	1300	1	65	19.0	1017.5	0
	1900	4	169	14.4	1015.5	0
6	100	3	197	14.4	1015.2	0
	700	3	212	16.2	1014.5	0
	1300	5	124	21.9	1012.1	0
	1900	6	154	19.4	1010.4	0
7	100	5	198	19.1	1008.4	0
	700	2	260	16.9	1008.7	0
	1300	3	14	20.1	1007.7	0
	1900	7	299	16.9	1010.4	0
8	100	6	308	13.0	1013.1	0
	700	7	307	10.6	1016.9	0
	1300	2	359	17.1	1018.9	0
	1900	4	324	13.3	1023.3	0
9	100	4	313	13.7	1026.7	0
	700	4	40	15.0	1030.1	0
	1300	4	62	17.0	1030.1	0
	1900	5	104	16.0	1030.1	0
10	100	4	62	16.4	1029.4	0
	700	4	23	18.5	1029.1	0
	1300	4	57	20.9	1027.7	0
	1900	5	94	18.8	1026.0	0
11	100	3	121	18.7	1024.0	0
	700	2	55	19.6	1022.3	0
	1300	2	95	22.5	1018.9	0
	1900	3	36	19.7	1017.2	0
12	100	14	24	16.5	1016.2	0
	700	15	8	14.2	1016.2	0
	1300	11	353	13.4	1014.2	0
	1900	12	2	13.3	1014.2	0
13	100	14	5	14.0	1013.5	0
	700	16	7	13.7	1014.8	0
	1300	17	12	13.5	1017.5	0
	1900	17	26	13.3	1020.3	0
14	100	17	24	13.6	1020.6	0
	700	15	23	14.4	1022.6	0
	1300	15	17	14.9	1023.0	0
	1900	13	14	13.9	1023.3	0
15	100	12	17	14.0	1022.3	0
	700	11	25	14.0	1022.6	0
	1300	9	20	15.2	1023.0	0
	1900	8	27	14.4	1023.0	0
16	100	6	34	14.8	1023.0	0
	700	8	24	15.5	1023.0	0
	1300	8	19	17.7	1022.6	0
	1900	6	37	16.6	1021.9	0

(Continued)

(Sheet 1 of 2)

TABLE 2: Meteorological Data

OCT 1987

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation	
		Speed	Direction	deg TN	deg C	Pressure	mm
		m/s	deg TN	deg C	mb	mm	
17	100	6	26	16.6	1020.9	0	
	700	4	11	17.1	1020.3	0	
	1300	4	31	19.7	1018.2	0	
	1900	3	29	17.2	1017.5	0	
18	100	3	335	15.9	1016.9	0	
	700	5	345	15.4	1017.9	0	
	1300	8	16	18.3	1018.6	0	
	1900	3	29	15.7	1018.6	0	
19	100	2	39	15.6	1018.9	0	
	700	3	17	16.5	1020.3	0	
	1300	5	39	17.9	1019.6	0	
	1900	5	61	16.2	1020.3	0	
20	100	2	54	15.9	1019.2	0	
	700	2	353	15.7	1019.2	0	
	1300	3	112	20.1	1017.5	0	
	1900	4	153	17.0	1016.5	0	
21	100	3	188	18.2	1015.2	0	
	700	4	236	18.2	1013.8	0	
	1300	12	351	15.3	1014.5	0	
	1900	5	0	14.1	1017.5	0	
22	100	9	331	9.1	1023.0	0	
	700	6	311	8.1	1026.0	0	
	1300	8	359	12.0	1027.0	0	
	1900	5	54	11.2	1028.0	0	
23	100	2	256	7.6	1029.1	0	
	700	3	303	10.5	1030.4	0	
	1300	3	113	16.8	1029.1	0	
	1900	6	124	15.1	1029.4	0	
24	100	1	148	12.3	1030.1	0	
	700	3	31	15.0	1030.4	0	
	1300	4	44	18.3	1028.7	0	
	1900	2	104	16.4	1026.7	0	
25	100	2	218	13.8	1024.3	0	
	700	2	259	14.7	1023.0	0	
	1300	12	7	15.8	1023.0	0	
	1900						
26	100		Operator Error				
	700						
	1300	7	35	14.2	1022.6	0	
	1900	7	40	13.1	1020.6	0	
27	100	8	41	14.6	1017.5	0	
	700	5	26	16.2	1014.8	0	
	1300	5	135	17.9	1009.1	60	
	1900	5	172	19.3	1006.7	9	
28	100	8	290	12.0	1010.4	0	
	700	6	328	11.4	1013.5	0	
	1300	5	332	14.2	1014.5	0	
	1900	3	296	11.4	1016.9	0	
29	100	5	315	9.7	1018.6	0	
	700	5	305	8.9	1021.3	0	
	1300	5	240	14.1	1020.9	0	
	1900	2	245	11.9	1022.6	0	
30	100	3	209	11.9	1024.3	0	
	700	3	230	12.6	1026.7	0	
	1300	5	196	18.1	1025.7	0	
	1900	5	190	14.5	1024.7	0	
31	100	6	227	14.1	1025.7	0	
	700	5	237	13.3	1027.4	0	
	1300	4	16	17.6	1028.7	0	
	1900	7	55	15.3	1030.4	0	

(Sheet 2 of 2)

III. WAVE DATA

Wave data are collected from two Baylor staff gages (Gages 625 and 645), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 6 hrs near 0100, 0700, 1300, and 1900 EST. The sampling rate is two times per second for 34 minutes.

Wave height (H_{m0}) is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. The wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. The period (T_p) is that associated with the maximum energy density in the spectrum. When this analysis is complete, the data are written to magnetic tape.

Table 3 presents the wave heights and periods for each wave record obtained during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed for all data records collected. Figure 3 is a time history of the H_{m0} and T_p values for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, or the presence of multiple wave trains containing nearly equal energy.

TABLE 3: WAVE DATA

OCT 1987

Day	Hour	645		625		111		630	
		Baylor Hmo,m	at 7+80 T,sec	Baylor Hmo,m	at 19+00 T,sec	Pressure Hmo,m	Gage T,sec	Farshr Hmo,m	Wvrdr T,sec
1	0100	0.50	8.83	0.75	8.83	0.68	8.00	0.89	8.83
	0700	0.98	5.12	1.20	5.22	1.25	4.49	1.66	4.92
	1300	1.10	5.57	1.05	6.40	1.05	5.82	1.55	5.69
	1900	0.66	6.09	0.71	5.82	0.66	5.95	0.91	5.69
2	0100	0.47	6.24	0.52	5.33	0.52	6.24	0.78	5.82
	0700	0.28	5.33	0.40	8.83	0.38	9.14	0.51	8.53
	1300	0.36	8.26	0.54	8.53	0.52	8.83	0.81	8.53
	1900	0.45	9.85	0.61	8.53	0.63	8.53	0.82	8.83
3	0100	0.36	8.26	0.57	8.83	0.55	8.53	0.63	8.53
	0700	0.27	9.14	0.43	8.53	0.47	9.14	0.52	8.53
	1300	0.27	8.00	0.45	8.00	0.48	8.00	0.62	7.76
	1900	0.90	5.33	1.00	5.02	1.10	4.57	1.54	5.82
4	0100	1.29	5.82	1.32	6.24	1.26	5.95	1.74	6.24
	0700	1.59	7.53	1.61	7.31	1.54	6.74	*	
	1300	1.11	6.92	1.35	8.00	1.18	8.00	1.63	6.09
	1900	0.78	5.45	0.80	6.74	0.77	6.56	*	
5	0100	0.56	5.12	0.60	6.40	0.58	5.12	*	
	0700	0.41	5.22	0.56	8.83	0.52	8.26	*	
	1300	0.42	4.66	0.59	7.76	0.56	9.48	*	
	1900	0.32	5.02	0.52	7.11	0.52	8.83	*	
6	0100	0.20	8.26	0.46	8.83	0.46	8.00	*	
	0700	0.21	8.00	0.45	9.85	0.44	9.48	*	
	1300	0.25	9.48	0.56	9.48	0.56	9.14	*	
	1900	0.49	8.53	0.75	9.14	0.68	9.48	*	
7	0100	0.49	9.85	0.75	9.48	0.76	9.85	*	
	0700	0.49	10.24	0.69	9.85	0.68	9.85	*	
	1300	0.34	9.85	0.67	10.24	0.70	10.24	0.81	11.13
	1900	0.40	10.67	0.69	10.67	0.66	10.67	0.84	10.67
8	0100	0.52	10.24	0.65	11.13	0.62	10.24	0.82	10.24
	0700	0.49	9.85	0.67	9.48	0.66	10.24	0.80	9.48
	1300	0.58	5.02	0.65	9.85	0.68	10.67	0.76	9.48
	1900	0.57	5.33	0.68	9.85	0.61	10.67	0.73	9.48
9	0100	0.51	4.66	0.58	9.85	0.57	10.24	0.66	10.24
	0700	0.54	4.41	0.71	9.85	0.65	9.14	0.79	9.85
	1300	0.51	4.92	0.65	9.48	0.68	9.48	0.70	8.26
	1900	0.40	9.14	0.65	8.53	0.60	8.83	0.69	8.53
10	0100	0.36	16.00	0.56	8.83	0.55	9.14	0.61	8.53
	0700	0.32	16.00	0.53	9.14	0.50	15.06	0.59	8.83
	1300	0.27	16.00	0.46	10.67	0.49	15.06	0.51	8.00
	1900	0.33	15.06	0.52	13.47	0.50	14.22	0.57	8.00
11	0100	0.27	15.06	0.49	13.47	0.46	14.22	0.56	14.22
	0700	0.28	13.47	0.53	8.00	0.52	8.83	0.61	7.76
	1300	0.35	8.26	0.60	8.00	0.66	8.00	0.83	7.76
	1900	0.37	8.26	0.72	8.26	0.67	8.83	0.81	8.53
12	0100	1.34	5.45	1.51	5.69	1.64	5.12	1.88	5.12
	0700	1.56	6.56	2.07	6.74	2.13	6.56	2.31	6.56
	1300	1.46	6.92	1.61	6.40	1.59	6.74	1.90	7.31
	1900	1.19	6.40	1.55	6.56	1.54	5.82	1.75	4.92
13	0100	1.46	6.09	1.83	5.82	1.83	5.95	1.99	6.56
	0700	1.35	7.11	2.28	7.76	2.33	7.11	2.60	7.31
	1300	1.80	7.53	2.67	7.76	2.76	8.00	3.01	7.53
	1900	1.53	7.76	2.63	8.00	2.85	8.00	2.87	8.00
14	0100	1.84	8.00	2.68	9.48	2.77	8.26	2.86	7.76
	0700	1.56	8.26	2.78	8.26	2.83	8.00	2.91	8.83
	1300	1.92	9.14	2.66	7.53	2.78	7.76	3.01	7.11
	1900	1.49	10.24	2.41	9.85	2.48	10.24	2.85	10.24
15	0100	1.64	10.67	2.35	10.67	2.41	11.13	2.48	9.48
	0700	1.54	11.13	2.45	11.13	2.18	11.13	2.18	9.48
	1300	1.54	10.67	2.00	10.67	2.05	10.67	2.02	9.85
	1900	1.23	11.64	1.71	10.67	1.66	10.67	1.70	10.24
16	0100	1.29	11.13	1.64	11.13	1.58	11.13	1.62	10.67
	0700	1.14	11.13	1.43	11.13	1.38	10.67	1.46	10.67
	1300	0.87	10.67	1.33	9.85	1.30	9.85	1.41	10.24
	1900	0.85	10.67	1.14	9.85	1.16	10.24	1.36	9.85

* Electronic problems

(Continued)

(Sheet 1 of 2)

TABLE 3: WAVE DATA

OCT 1987

Day	Hour	645		625		111		630	
		Baylor at 7+80		Baylor at 19+00		Pressure Gage		Farshr Wvrdr	
		Hmo,m	T,sec	Hmo,m	T,sec	Hmo,m	T,sec	Hmo,m	T,sec
17	0100	0.76	9.48	1.12	9.85	1.06	9.48	1.25	9.48
	0700	0.69	9.85	0.99	9.14	0.95	10.24	1.08	9.48
	1300	0.77	9.48	0.98	9.48	0.94	9.85	1.15	8.83
	1900	0.61	9.48	0.88	8.53	0.87	9.14	0.95	8.26
18	0100	0.59	9.85	0.89	10.67	0.85	10.24	1.02	8.83
	0700	0.56	8.83	0.82	8.53	0.78	8.83	0.88	9.14
	1300	0.71	4.20	0.96	8.53	0.95	9.14	1.21	4.20
	1900	0.67	5.57	0.99	9.48	0.95	9.48	1.09	9.14
19	0100	0.61	9.14	0.80	9.14	0.78	8.83	0.90	8.53
	0700	0.50	8.83	0.71	8.83	0.68	9.14	0.81	9.14
	1300	0.46	9.14	0.76	8.00	0.71	8.83	0.85	8.00
	1900	0.46	8.00	0.74	8.53	0.69	8.83	0.84	8.00
20	0100	0.50	8.53	0.74	7.76	0.72	8.53	0.83	8.83
	0700	0.46	8.83	0.65	8.26	0.63	8.83	0.85	9.14
	1300	0.50	8.26	0.65	8.53	0.58	8.00	0.67	8.00
	1900	0.39	8.53	0.58	8.83	0.58	8.53	0.66	8.53
21	0100	0.42	8.53	0.57	9.14	0.56	8.00	0.69	9.14
	0700	0.34	9.85	0.50	8.26	0.56	8.53	0.60	8.26
	1300	0.80	4.06	1.00	3.88	1.23	3.94	1.27	4.20
	1900	0.97	6.40	1.03	5.82	1.02	6.24	1.36	5.95
22	0100	1.13	5.82	1.37	5.69	1.35	5.82	1.72	5.95
	0700	1.43	6.40	1.43	6.56	1.47	6.56	1.84	6.56
	1300	1.05	6.09	1.16	6.40	1.12	6.24	1.29	6.09
	1900	0.77	6.09	0.81	5.95	0.82	6.09	1.00	5.82
23	0100	0.55	5.45	0.63	10.67	0.59	11.64	0.75	5.95
	0700	0.45	6.24	0.56	10.24	0.55	9.85	0.61	5.22
	1300	0.39	11.13	0.48	10.67	0.50	9.48	0.54	6.24
	1900	0.30	10.24	0.52	9.48	0.49	9.85	0.56	6.74
24	0100	0.31	14.22	0.51	10.24	0.50	8.26	0.56	8.00
	0700	0.28	13.47	0.51	6.92	0.54	8.83	0.59	7.76
	1300	0.34	13.47	0.56	7.11	0.54	7.31	0.64	7.11
	1900	0.32	8.53	0.68	7.76	0.68	8.53	0.79	7.53
25	0100	0.32	7.11	0.65	7.11	0.63	8.26	0.78	7.53
	0700	0.44	6.74	0.81	7.31	0.81	7.76	0.95	6.24
	1300	1.00	4.74	1.25	4.92	1.38	5.02	1.50	4.92
	1900								
26	0100								
	0700								
	1300	0.91	5.22	1.14	9.85	1.12	9.85	1.32	10.24
	1900	0.89	5.22	1.12	10.24	1.11	10.67	1.30	10.24
27	0100	0.79	10.67	1.13	10.67	0.96	10.67	1.18	10.67
	0700	0.75	9.85	0.92	10.24	0.91	9.48	1.03	9.85
	1300	0.69	9.48	0.93	9.48	0.93	9.48	1.12	9.85
	1900	0.94	7.11	1.32	6.92	1.41	6.92	1.72	6.92
28	0100	0.53	7.53	1.04	8.83	0.95	8.53	1.34	7.53
	0700	0.72	6.09	0.91	8.00	0.89	7.76	1.19	7.31
	1300	0.73	5.45	0.87	5.45	0.87	5.45	1.13	5.69
	1900	0.67	5.57	0.76	9.14	0.73	9.85	0.91	5.22
29	0100	0.53	9.85	0.66	9.14	0.65	9.85	0.78	9.48
	0700	0.78	5.12	0.86	4.83	0.85	8.83	0.93	4.92
	1300	0.56	5.45	0.66	8.26	0.63	9.14	0.78	9.48
	1900	0.44	4.66	0.52	9.85	0.54	8.83	0.58	8.53
30	0100	0.31	9.85	0.47	8.83	0.47	9.48	0.58	9.48
	0700	0.25	10.24	0.42	9.48	0.39	9.14	0.47	9.14
	1300	0.27	9.48	0.46	9.48	0.47	9.14	0.61	8.83
	1900	0.35	9.14	0.50	9.48	0.46	9.48	0.57	8.83
31	0100	0.27	9.85	0.47	9.85	0.49	10.24	0.56	9.85
	0700	0.26	9.85	0.37	9.85	0.43	9.48	0.50	9.48
	1300	0.25	9.48	0.48	9.14	0.41	8.83	0.48	8.83
	1900	0.56	3.12	0.67	9.48	0.52	9.85	0.69	9.48
Mean		0.70	8.30	0.96	8.59	0.95	8.78	1.14	8.14
Std dev		0.43	2.74	0.58	1.74	0.59	1.95	0.64	1.76

* Electronic problems

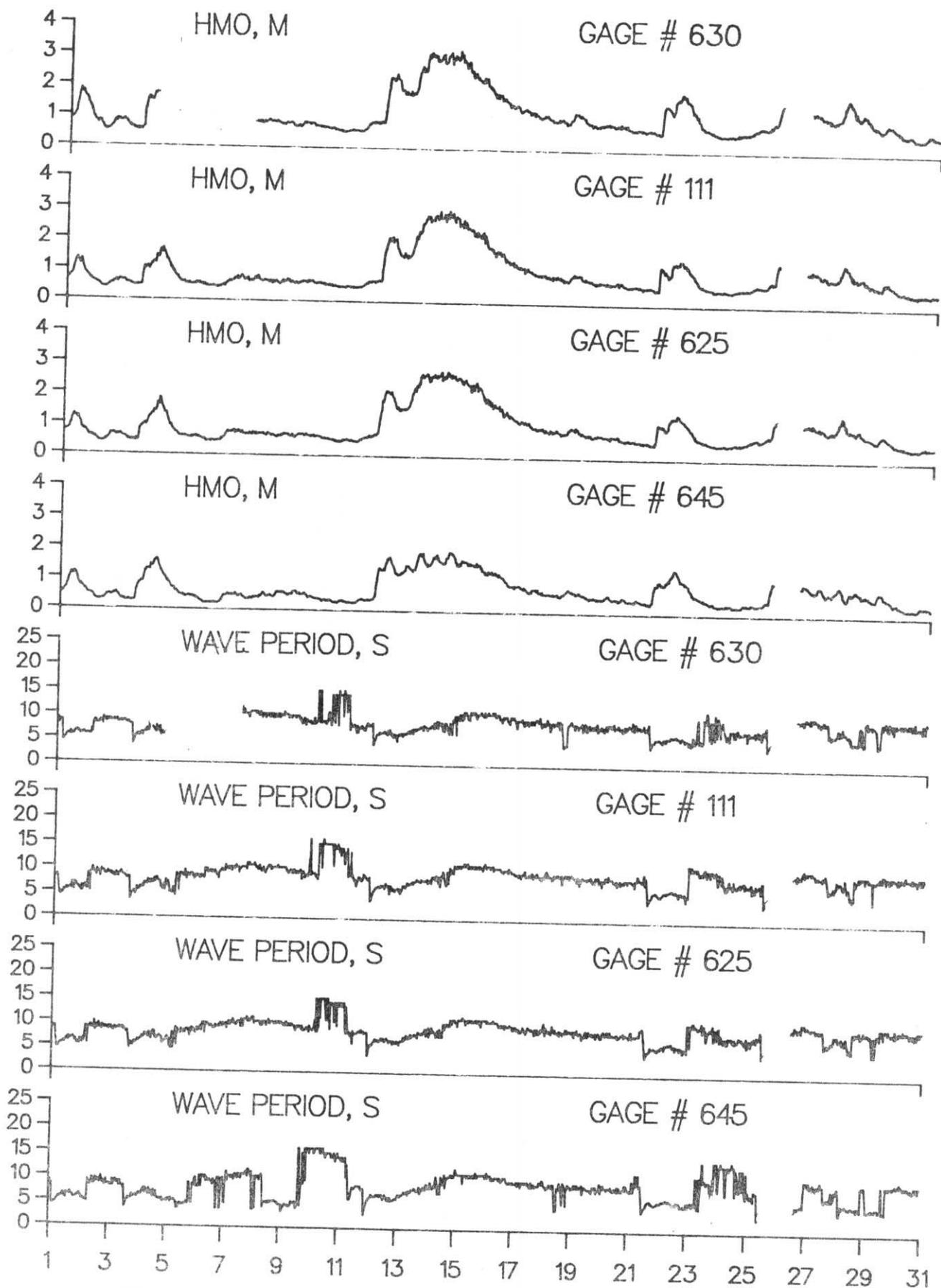


FIGURE 3. Time History of Wave Heights and Periods - October 1987

IV. CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, alongshore currents flow either toward 340 (i.e. northward) or toward 160 (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second.

TABLE 4: Current Data
OCT 1987

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements					Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679	
			Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed Dir		Dye 12m offshore (surface)	Location Speed Dir	Speed	Dir	
			Speed	Dir		Speed	Dir					
1	0100	-Along Cross Result								8	S	
										1	on	
										8	167	
1	0700	-Along Cross Result	61 6 61	S off 154	274	61 18 64	S off 143	no observation		24	S	
										2	off	
										24	155	
1	1300	-Along Cross Result								15	S	
										1	off	
										15	156	
1	1900	-Along Cross Result								17	S	
										1	off	
										17	157	
2	0100	-Along Cross Result								12	S	
										4	off	
										13	142	
2	0700	-Along Cross Result	14 0 14	N 340	201	3 0 3	N on 331	South 30 N		1	S	
										1	off	
										1	115	
2	1300	-Along Cross Result								16	N	
										4	on	
										16	326	
2	1900	-Along Cross Result								14	N	
										1	on	
										14	336	
3	0100	-Along Cross Result								10	N	
										4	on	
										11	318	
3	0700	-Along Cross Result	5 4 7	S off 118	238	3 0 3	N off 346	North 114 N		2	S	
										1	on	
										2	187	
3	1300	-Along Cross Result								5	N	
										4	on	
										6	301	
3	1900	-Along Cross Result								22	S	
										1	off	
										22	157	
4	0100	-Along Cross Result								19	S	
										0		
										19	160	
4	0700	-Along Cross Result	27 13 30	S off 133	213	68 0 68	S 160	North 123 S		27	S	
										4	off	
										27	152	
4	1300	-Along Cross Result								10	S	
										3	off	
										10	143	
4	1900	-Along Cross Result								11	S	
										9	off	
										14	121	
5	0100	-Along Cross Result								9	N	
										0		
										9	340	
5	0700	-Along Cross Result	0 0 0	 0	201	8 3 9	S on 179	North 18 S		7	N	
										1	off	
										7	348	
5	1300	-Along Cross Result								13	N	
										0		
										13	340	
5	1900	-Along Cross Result								12	N	
										1	on	
										12	335	

KEY = All speeds in CM/SEC
N = Northward, Shore parallel
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on = onshore off = offshore

TABLE 4: Current Data
OCT 1987

Day	Time	Pier Measurements					Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679		
		Alongshore Cross-shore Resultant		Dye at (579 m) (surface) Speed Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed Dir	Dye 12m offshore (surface) Location Speed Dir	Speed	Dir	Speed	Dir	
6	0100	Along Cross Result								12	N	
6	0700	Along Cross Result	8 5 10	N off 11	165	13 0 13	N 340	South	9	N	12 4 0 4	on 326 N 340
6	1300	Along Cross Result									7 0 7	N 340
6	1900	Along Cross Result									17 2 17	N on 333
7	0100	Along Cross Result									20 3 20	N on 331
7	0700	Along Cross Result	3 2 3	N off 17	189	0 0 0		South	20	N	7 0 7	N 340
7	1300	Along Cross Result									3 3 4	S on 205
7	1900	Along Cross Result									5 1 5	N on 329
8	0100	Along Cross Result									11 1 11	S off 155
8	0700	Along Cross Result	28 6 28	S off 149	152	15 5 16	S off 141	North	34	S	13 0 13	S 160
8	1300	Along Cross Result									11 3 11	S off 145
8	1900	Along Cross Result									3 1 3	S on 178
9	0100	Along Cross Result									6 1 6	S off 151
9	0700	Along Cross Result	5 3 6	S on 187	177	5 1 6	S on 169	North	17	S	0 0 0	
9	1300	Along Cross Result									5 5 7	S off 115
9	1900	Along Cross Result									11 2 11	N on 330
10	0100	Along Cross Result									5 0 5	N 340
10	0700	Along Cross Result	16 10 19	N on 309	177	3 1 3	N off 351	no observation			11 0 11	N 340
10	1300	Along Cross Result									4 1 4	N off 354
10	1900	Along Cross Result									15 3 15	N on 329

KEY = All speeds in CM/SEC
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 on = onshore off = offshore

TABLE 4: Current Data
OCT 1987

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679		
			Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Location	Speed	Dir	Speed	Dir
11	0100	Along Cross Result									4 1 4	N on 326
11	0700	Along Cross Result	14 1 14	N off 343	201	2 1 3	N on 311	North	43	N	9 2 9	N on 327
11	1300	Along Cross Result									1 1 1	S on 205
11	1900	Along Cross Result									3 1 3	N on 322
12	0100	Along Cross Result									30 3 30	S off 154
12	0700	Along Cross Result	76 0 76	S 160	482	76 0 76	S 160	no observation			43 5 43	S off 153
12	1300	Along Cross Result									34 1 34	S off 158
12	1900	Along Cross Result									36 2 36	S off 157
13	0100	Along Cross Result									42 4 42	S off 155
13	0700	Along Cross Result	76 0 76	S 160	506	87 0 87	S 160	no observation			53 5 53	S off 155
13	1300	Along Cross Result									65 7 65	S off 154
13	1900	Along Cross Result									68 11 69	S off 151
14	0100	Along Cross Result									62 9 63	S off 152
14	0700	Along Cross Result	102 0 102	S 160	579	102 0 102	S 160	no observation			64 9 65	S off 152
14	1300	Along Cross Result									56 8 57	S off 152
14	1900	Along Cross Result									50 9 51	S off 150
15	0100	Along Cross Result									36 6 36	S off 151
15	0700	Along Cross Result	51 5 51	N off 346	579	51 5 51	N off 346	no observation			31 3 31	S off 154
15	1300	Along Cross Result									28 3 28	S off 154
15	1900	Along Cross Result									27 1 27	S off 158

KEY = All speeds in CM/SEC
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 on = onshore off = offshore

TABLE 4: Current Data
OCT 1987

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m UpDrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679		
			Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface) Location	Speed	Dir	Speed	Dir
16	0100	Along Cross Result									8 1 8	S off 153
16	0700	Along Cross Result	20 0 20	S 160	274	19 7 20	S off 141	North	15	S	9 2 9	S off 147
16	1300	Along Cross Result									4 0 4	S 160
16	1900	Along Cross Result									19 1 19	S off 157
17	0100	Along Cross Result									14 1 14	S off 156
17	0700	Along Cross Result	38 0 38	S 160	299	0 0 0		North	27	S	17 1 17	S off 157
17	1300	Along Cross Result									20 8 22	S off 138
17	1900	Along Cross Result									22 3 22	S off 152
18	0100	Along Cross Result									16 5 17	S off 143
18	0700	Along Cross Result	41 30 51	S on 197	213	5 13 14	S on 230	no observation			20 8 22	S off 138
18	1300	Along Cross Result									14 4 15	S off 144
18	1900	Along Cross Result									14 3 14	S off 148
19	0100	Along Cross Result									13 4 14	S off 143
19	0700	Along Cross Result	27 0 28	S 160	189	0 0 0		North	43	S	12 1 12	S off 155
19	1300	Along Cross Result									1 6 6	N off 61
19	1900	Along Cross Result									16 3 16	S off 149
20	0100	Along Cross Result									9 1 9	S off 154
20	0700	Along Cross Result	32 0 32	S 160	152	0 0 0		South	27	S	9 2 9	S off 147
20	1300	Along Cross Result									2 4 4	S off 97
20	1900	Along Cross Result									2 0 2	N 340

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TABLE 4: Current Data
OCT 1987

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679		
			Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Location	Speed	Dir	Speed	Dir
21	0100	Along Cross Result									1 2 2	N on 277
21	0700	Along Cross Result	0 0 0		140	5 1 5	N off 351	North	7 N		2 0 2	N 340
21	1300	Along Cross Result									24 1 24	S off 158
21	1900	Along Cross Result									19 0 19	S 160
22	0100	Along Cross Result									28 2 28	S off 156
22	0700	Along Cross Result	0 0 0		287	34 5 34	S off 151	North	69 S		23 4 23	S off 150
22	1300	Along Cross Result									20 4 20	S off 149
22	1900	Along Cross Result									12 2 12	S off 151
23	0100	Along Cross Result									4 2 4	S off 133
23	0700	Along Cross Result	12 1 12	S on 163	165	9 42 43	S off 82	North	69		2 3 4	S off 104
23	1300	Along Cross Result									2 2 3	S off 115
23	1900	Along Cross Result									10 3 10	N on 323
24	0100	Along Cross Result									4 4 6	N on 295
24	0700	Along Cross Result	9 6 11	N on 305	165	6 2 6	N on 321	North	9 S		8 1 8	N on 333
24	1300	Along Cross Result									1 1 1	S on 205
24	1900	Along Cross Result									2 2 3	N on 295
25	0100	Along Cross Result									4 1 4	S off 146
25	0700	Along Cross Result	0 0 0		189	8 4 9	N off 4	North	1 N		8 4 9	N on 313
25	1300	Along Cross Result									24 2 24	S off 155
25	1900	Along Cross Result										

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 N = Northward, Shore parallel
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 on = onshore off = offshore

TABLE 4: Current Data
OCT 1987

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679		
			Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface) Location	Speed	Dir	Speed	Dir
26	0100	Along Cross Result										
26	0700	Along Cross Result	23 8 25	S off 141	140	34 15 37	S off 136	North	67	S		
26	1300	Along Cross Result									15	S
26	1900	Along Cross Result									2 15	off 152
27	0100	Along Cross Result									12 3 12	S off 146
27	0700	Along Cross Result	11 4 12	S on 179	128	15 4 15	S on 177	North	6	S	17 2 17	S off 153
27	1300	Along Cross Result									7 0 7	S 160
27	1900	Along Cross Result									12 4 13	S off 142
28	0100	Along Cross Result									8 0 8	S 160
28	0700	Along Cross Result	34 0 34	S 160	140	5 2 6	S off 143	North	53	S	11 11 0	S on 175
28	1300	Along Cross Result									11 14 1	S off 156
28	1900	Along Cross Result									14 10 2 10	S off 149
29	0100	Along Cross Result									13 1 13	S off 156
29	0700	Along Cross Result	12 1 12	S off 154	128	55 8 56	S off 151	North	24	S	5 1 5	S off 149
29	1300	Along Cross Result									2 0 2	N 340
29	1900	Along Cross Result									4 3 5	N on 303
30	0100	Along Cross Result									6 3 7	N on 313
30	0700	Along Cross Result	25 8 27	N off 357	152	34 10 35	N off 357	South	43	S	7 2 7	N on 324
30	1300	Along Cross Result									13 4 14	N on 323
30	1900	Along Cross Result									8 6 10	N on 303

KEY = All speeds in CM/SEC
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 on = onshore off = offshore

TABLE 4: Current Data
OCT 1987

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679		
			Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Location	Speed	Dir	Speed	Dir
31	0100	Along Cross Result									12	N
											7	on
											14	310
31	0700	Along Cross Result	15 4 16	N off 354	179	15 39 42	N on 271	North	5	S	9	N
											3	on
											9	322
31	1300	Along Cross Result									11	N
											3	on
											11	325
31	1900	Along Cross Result									2	S
											0	
											2	160

KEY = All speeds in CM/SEC
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V. SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) taken at the seaward end of the pier are made of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves) but not surface chop or capillary waves. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring alignment of the wave crests. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 east of true north; consequently, wave angles greater than 70 imply the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are made daily at the seaward end of the FRF pier. A jar along with a thermometer is lowered about .3 m (1 ft) into the water and allowed to remain for at least one minute. The jar is removed, the temperature read and a hydrometer is used to determine the density. A secci disc is used to determine the surface visibility.

TABLE 5: Supplemental Observations

OCT 1987

DAY	TIME	WAVE APPROACH ANGLE AT PIER END deg from True N		RADAR WAVE ANGLE deg from True N	WIDTH OF SURF ZONE, m	WATER CHARACTERISTICS AT PIER END		
		Primary	Secondary			TEMP, C	DENSITY g/cc	SECCI VIS, m
1	717	40		50	84	21.1	1.0222	0.9
2	725	60			37	21.1	1.0220	1.8
3	900	110			34	22.2	1.0220	4.0
4	930	40			122	19.5	1.0226	1.5
5	647	90	30		40	18.9	1.0222	2.1
6	700	100	50		46	20.0	1.0222	3.4
7	730	100	40		73	20.6	1.0220	3.0
8	703	80			27	19.5	1.0222	2.7
9	715	40			49	19.5	1.0224	3.4
10	818	100			52	20.6	1.0224	4.9
11	955	100			71	20.6	1.0224	5.8
12	734	50		50	335	19.5	1.0226	0.9
13	728	50		60	360	17.2	1.0204	0.6
14	700	70		65	463	16.0	1.0204	0.3
15	635	70		70	457	16.1	1.0210	0.3
16	784	80		70	244	16.7	1.0210	3.0
17	911	70			143	17.8	1.0214	0.0
18	1015	55	30		164	17.8	1.0200	3.7
19	600	70			55	16.7	1.0204	2.4
20	725	70			50	17.2	1.0204	3.7
21	745	100			43	18.8	1.0204	1.8
22	630	50			73	15.6	1.0226	1.8
23	847	75	30		58	15.9	1.0226	3.7
24	834	95			75	17.2	1.0224	4.3
25	852	90	120		115	17.2	1.0224	2.7
26	830	50		70	96	16.1	1.0226	1.8
27	824	70	50		64	16.1	1.0220	1.8
28	810	50		60	70	15.6	1.0220	1.8
29	730	60	50		67	15.6	1.0220	1.8
30	800	50		80	49	15.0	1.0220	1.5
31	914	80			69	16.1	1.0226	2.1

VI. WATER LEVELS

The National Ocean Services (NOS) has established a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect data every 6 minutes throughout the month.

Figure 4 shows the variation in mean water levels computed over a tidal cycle period (12.42 hours), and contains a list of selected mean and extreme values. This presentation is useful in identifying effects on both meteorological and astronomical forces on the open coast water levels.

Table 6 contains the time of the center of each sampling interval and the range, high, low, and mean water levels during each tidal cycle.

FRF TIDE HEIGHTS
OCT 1987

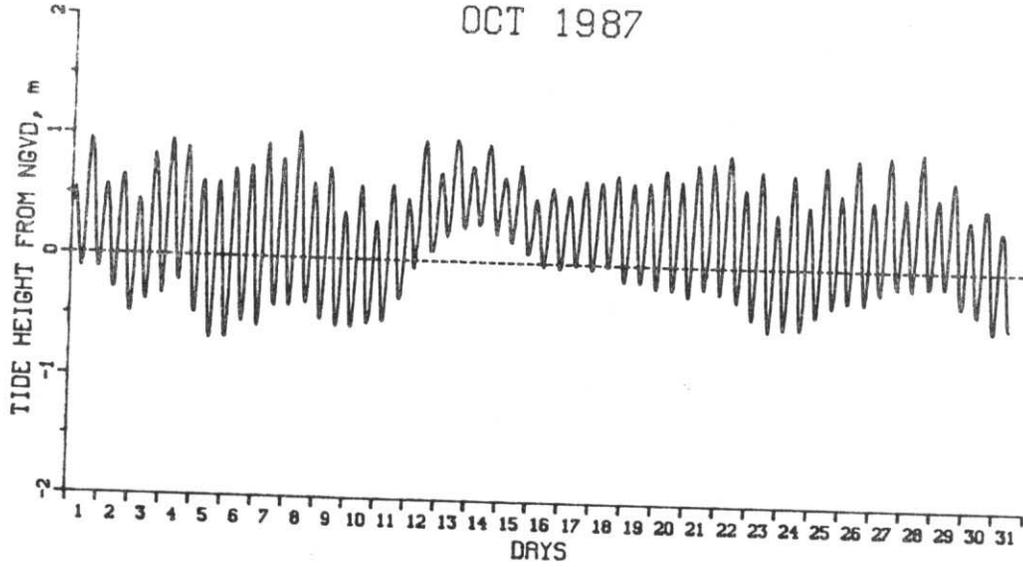


FIGURE 4. Time History of Mean Water Levels, October 1987

MONTHLY WATER LEVELS (METERS NGVD)

EXTREME LOW = -0.68 ON DAY 5 AT 1148HRS.
EXTREME HIGH = 1.05 ON DAY 8 AT 712HRS.
MONTHLY MEAN = 0.24
MEAN LOW = -0.25
MEAN HIGH = 0.77
MEAN RANGE = 1.02

Table 6: WATER LEVELS, METERS NGVD

		OCT 1987			
MID-CYCLE		LOW	HIGH	MEAN	RANGE
DAY	TIME				
1	612	-0.11	0.82	0.29	0.93
1	1837	-0.11	0.96	0.39	1.07
2	703	-0.28	0.58	0.17	0.86
2	1928	-0.48	0.66	0.08	1.13
3	753	-0.37	0.66	0.10	1.03
3	2018	-0.32	0.84	0.30	1.16
4	843	-0.20	0.97	0.39	1.17
4	2109	-0.47	0.90	0.20	1.37
5	934	-0.68	0.62	-0.02	1.30
5	2159	-0.67	0.62	-0.01	1.29
6	1024	-0.54	0.73	0.11	1.26
6	2249	-0.57	0.76	0.11	1.33
7	1115	-0.40	0.94	0.25	1.34
7	2340	-0.40	0.82	0.23	1.22
8	1205	-0.37	1.05	0.31	1.42
9	30	-0.50	0.63	0.08	1.13
9	1255	-0.56	0.76	0.06	1.31
10	121	-0.56	0.40	-0.07	0.96
10	1346	-0.53	0.61	0.00	1.14
11	211	-0.51	0.45	-0.06	0.96
11	1436	-0.32	0.63	0.12	0.95
12	301	-0.06	0.87	0.31	0.93
12	1527	0.08	1.00	0.48	0.92
13	352	0.21	0.95	0.52	0.74
13	1617	0.28	1.02	0.63	0.74
14	442	0.30	0.88	0.58	0.58
14	1707	0.23	0.88	0.60	0.75
15	532	0.17	0.71	0.46	0.54
15	1758	0.08	0.81	0.41	0.74
16	623	-0.02	0.54	0.27	0.56
16	1848	-0.04	0.64	0.30	0.68
17	713	-0.01	0.58	0.30	0.59
17	1938	-0.04	0.69	0.32	0.73
18	804	-0.01	0.69	0.35	0.70
18	2029	-0.13	0.75	0.30	0.88
19	854	-0.14	0.69	0.27	0.83
19	2119	-0.18	0.69	0.27	0.88
20	944	-0.19	0.80	0.30	0.99
20	2210	-0.25	0.71	0.25	0.96
21	1035	-0.18	0.86	0.34	1.04
21	2300	-0.22	0.87	0.36	1.09
22	1125	-0.28	0.94	0.31	1.22
22	2350	-0.43	0.67	0.14	1.10
23	1216	-0.52	0.81	0.10	1.34
24	41	-0.50	0.67	0.03	1.17
24	1306	-0.50	0.79	0.10	1.29
25	131	-0.40	0.76	0.12	1.15
25	1356	-0.31	0.86	0.24	1.18
26	222	-0.27	0.87	0.22	1.14
26	1447	-0.28	0.92	0.27	1.20
27	312	-0.20	0.85	0.25	1.05
27	1537	-0.14	0.95	0.35	1.10
28	402	-0.15	0.86	0.28	1.01
28	1628	-0.13	0.99	0.36	1.12
29	453	-0.13	0.64	0.26	0.77
29	1718	-0.29	0.75	0.19	1.05
30	543	-0.36	0.43	0.06	0.79
30	1808	-0.50	0.53	0.02	1.02
31	634				
31	1859				

Gage Inoperative

VII. NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Zeiss surveying system; a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Because of equipment problems, no surveys were conducted in October. A contour map from a bathymetric survey in September is provided as a reference (Figure 5).

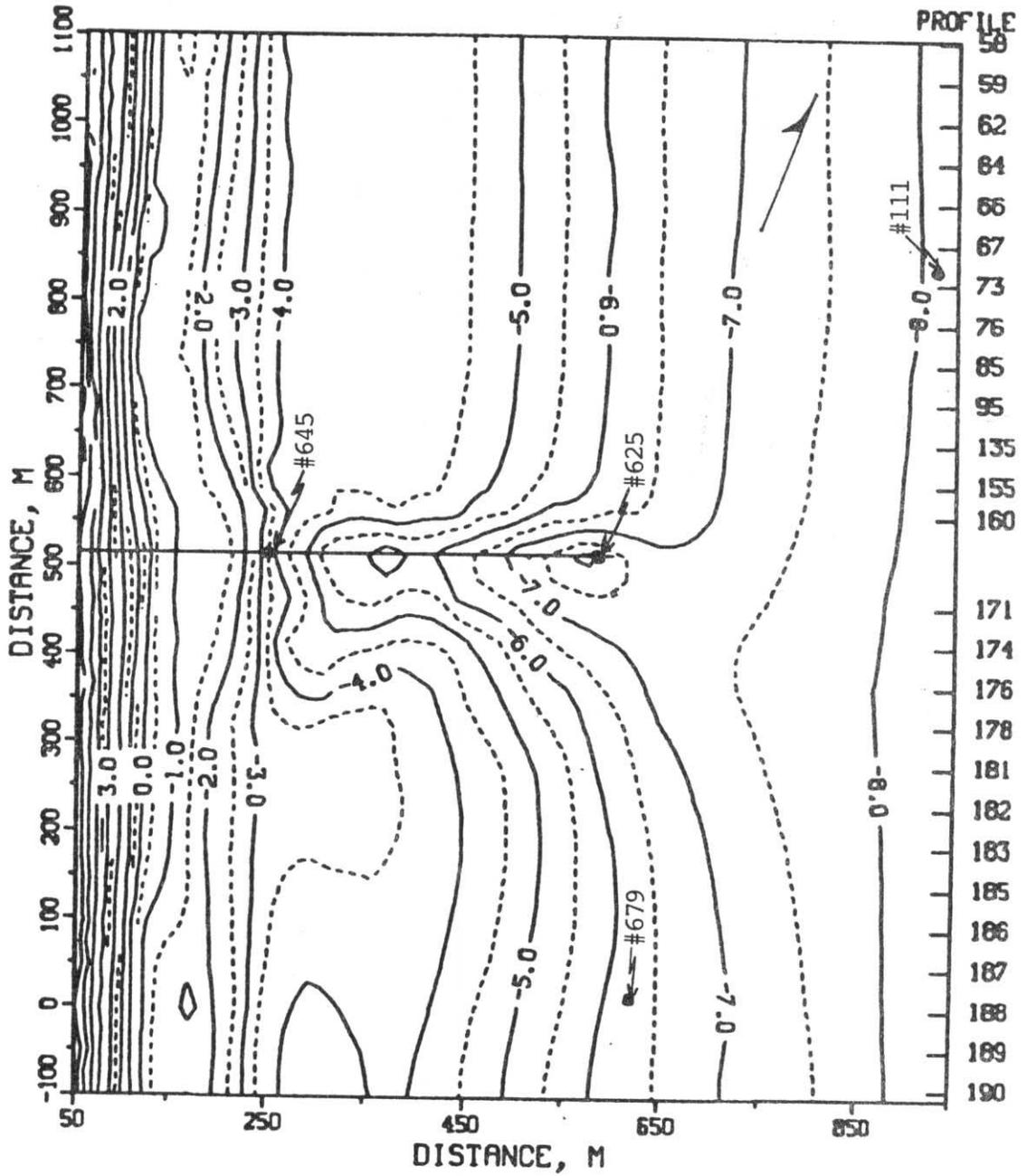


FIGURE 5. FRF BATHYMETRY 1 SEP 87
 CONTOURS IN METERS

VIII. SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the wave height at the seaward end of the pier (i.e. as measured by the Baylor Gage #625 at pier station 19+00) exceeded 2 m. When this occurred, four contiguous 34-min wave records were obtained every three hours:

<u>Start</u>	<u>End</u>
12 Oct (0400)	15 Oct (1142)

B. Storm Synopsis.

12-15 October: Following the passage of a cold front late on 11 October, strong onshore winds (N to NNE) generated by a huge high pressure system located in the central United States rapidly produced storm waves at the FRF. Onshore winds exceeded 10 m/s for 86 consecutive hours with the peak wind speed of 17 m/s (NNE) occurring at 1934 hrs on 13 October. Waves above 2 m were recorded for 80 consecutive hrs with the maximum Hmo (Gage #625) of 2.77 m (period = 8.53 sec) occurring on 14 October at 0208 hrs.

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